

Iowa Hazardous Substances Emergency Events Surveillance (HSEES)

2006-2007 Follow-Up Report on Anhydrous Ammonia

Bureau of Environmental Health Services
Division of Environmental Health
Iowa Department of Public Health

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Disease Registry (ATSDR)

INTRODUCTION

The culture and economy of Iowa is deeply rooted in farming. There are 99 counties in Iowa, 88 of which are considered rural. Agriculture remains the primary industry. Because of the high volume of anhydrous ammonia used in agriculture in Iowa, it continues to be the most commonly released hazardous substance. There are approximately 850 storage sites in Iowa and approximately 25,000-26,000 nurse tanks. There are two underground pipelines covering 668 miles. Approximately 650,000-700,000 tons of agricultural ammonia is used per year. Two ammonia producers are located in Iowa.

Ammonia is a chemical compound containing the elements nitrogen and hydrogen. It is one of the most elementary compounds and is present naturally in our atmosphere. Ammonia is often used for agricultural purposes, for refrigeration, and as a cleaner when dissolved in water. To avoid confusion, the term “ammonia” will be used consistently throughout this report. Although other terms such as anhydrous ammonia, aqueous ammonia, or ammonia gas may be more accurate, the toxicity varies only because of the route through which anyone may be exposed to the various forms of ammonia. Examples of these routes are breathing or skin contact.

Eighty percent of ammonia produced in the world is used for agricultural application where it serves as a fertilizer delivered by bubbling into irrigation water or by direct injection into the soil. Less than two percent is used for refrigeration. Other uses for ammonia include the manufacture of dyes, drugs, synthetic fibers, plastics, explosives, and as a component in cleaning materials. Over a million employees and customers of the ammonia industry use it daily, creating a serious potential for unintentional release and injury.

Exposure to ammonia is extremely irritating to the eyes, nose, throat, lungs, skin and mucous membranes. Exposure to high levels of ammonia can cause dizziness and central nervous system symptoms, chemical burns and death.

BACKGROUND

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous substances Emergency Events Surveillance (HSEES) system to describe the public health consequences associated with the release of hazardous substances. The Iowa Department of Public Health (IDPH) was one of five states to pilot this system and has remained an active participant.

This report is a follow up to the *2001-2002 Report on Anhydrous Ammonia* that was prepared by staff in the Iowa Department of Public Health's HSEES program. This report contains comparative data for the period of 2001-2002 and 2006-2007. Various sources were used to obtain information about emergency or unintentional releases. These sources included written records and oral reports from the Iowa Department of Natural Resources, Division of Narcotics Enforcement, Iowa Poison Control Center, National Response Center, hazardous materials teams, local police and fire departments, and responsible parties. For an ammonia release to be included in the HSEES system, it must meet the following criteria.

- 1) An acute, unintentional or illegal release; or

- 2) A threatened release that results in a public health consequence such as an evacuation.

Prevention and outreach activities have occurred since the 2001-2002 Report on Anhydrous Ammonia. The purpose of this report is to compare data to determine the usefulness of these activities.

RESULTS

In 2006 and 2007 there were 252 ammonia releases reported to the HSEES program. In 2001 and 2002 there were 230 releases. Figure 1 and Figure 2 are comparisons of ammonia releases by month for the two data collection periods.

Figure 1
Total Ammonia Releases by Month
Hazardous Substances Emergency Events Surveillance System
Iowa
2001-2002

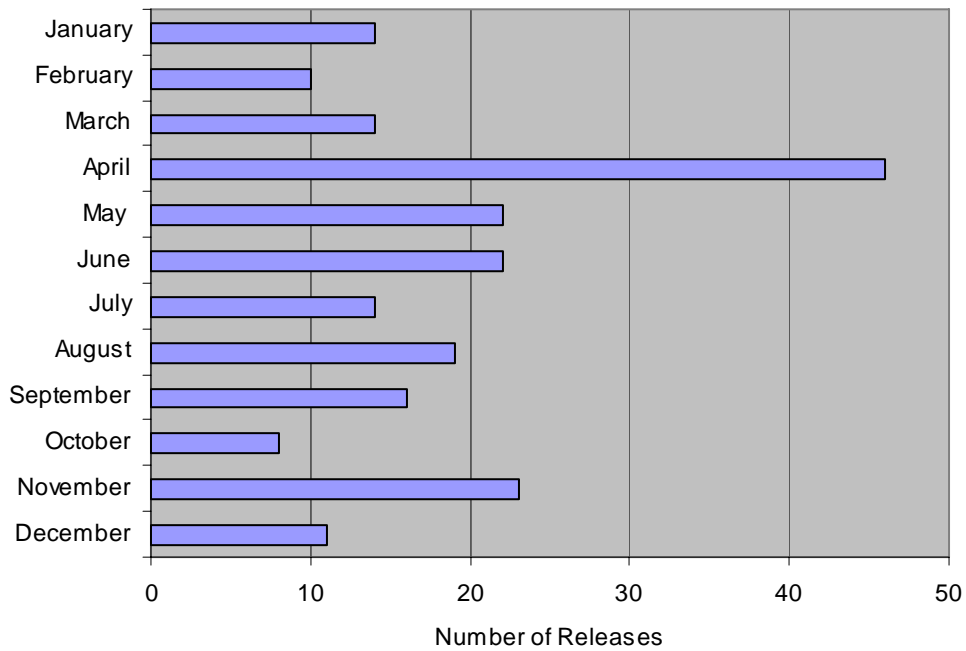


Figure 2
Total Ammonia Releases by Month
Hazardous Substances Emergency Events Surveillance System
Iowa
2006-2007

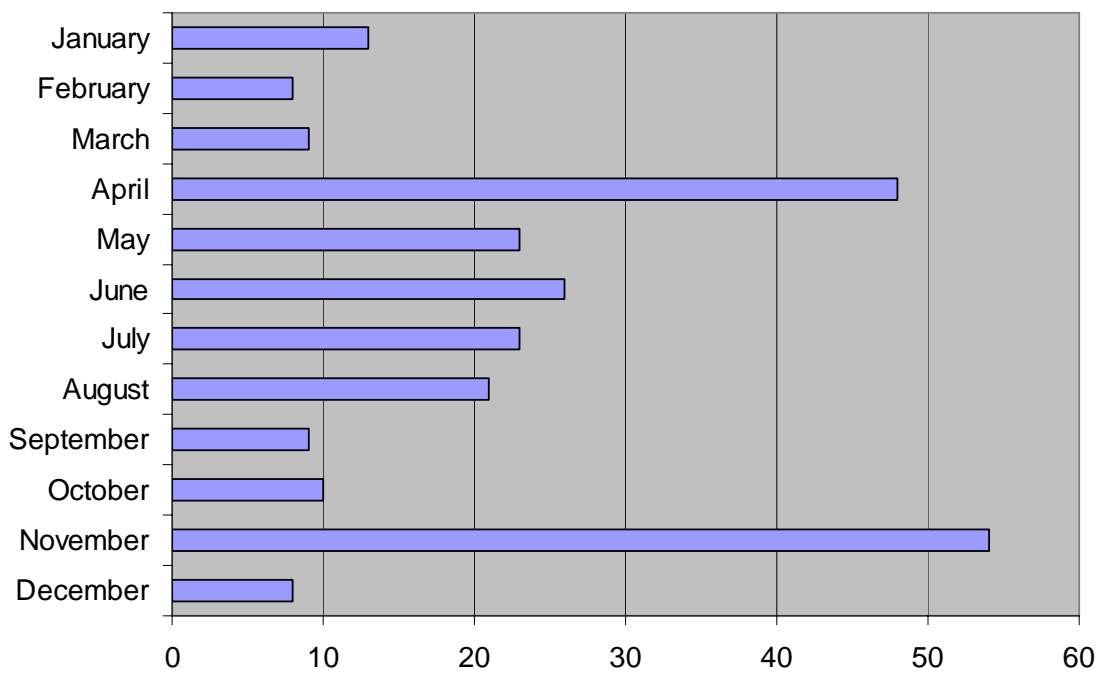


Figure 3 and 4 show comparison categories of the responsible parties of all ammonia releases.

Figure 3
Ammonia Releases by Responsible Party Category
Hazardous Substances Emergency Events Surveillance System
Iowa
2001-2002

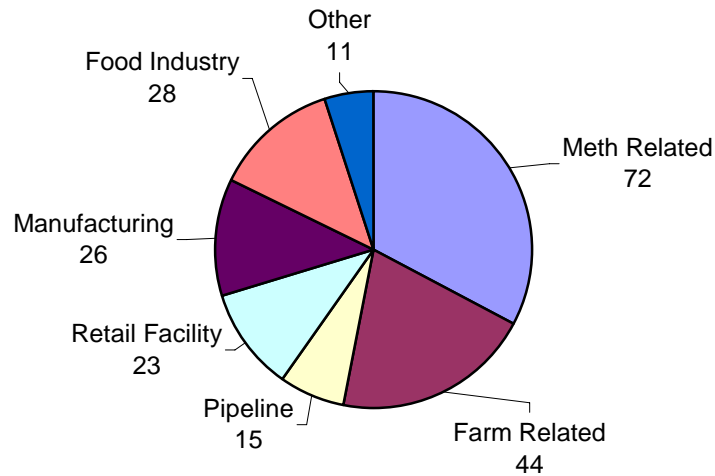
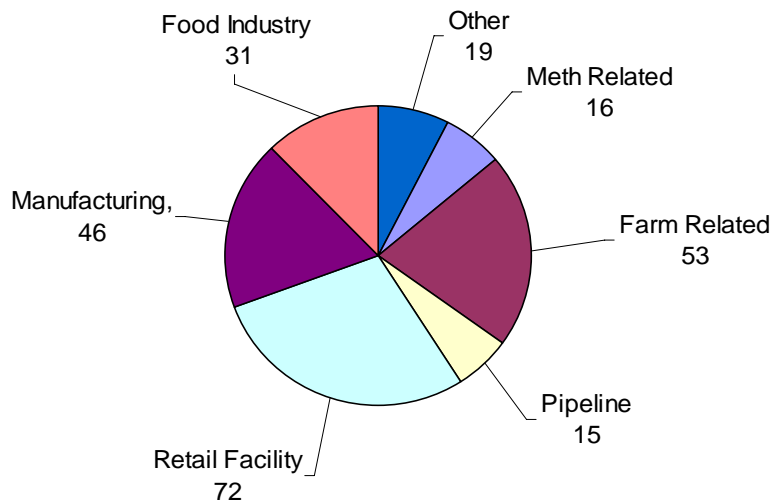


Figure 4
Ammonia Releases by Responsible Party Category
Hazardous Substances Emergency Events Surveillance System
Iowa
2006-2007



Releases are categorized into two types – fixed facility or transportation. Events are defined as transportation-related if they occur during surface, air, pipeline, or water transport of hazardous substances, or before being unloaded from a vehicle or vessel. All other events are considered fixed-facility events. Figures 5 and 6 are comparisons of the type of releases for the two data collection periods.

Figure 5
Ammonia Releases by Type
Hazardous Substances Emergency Events Surveillance System
Iowa
2001-2002

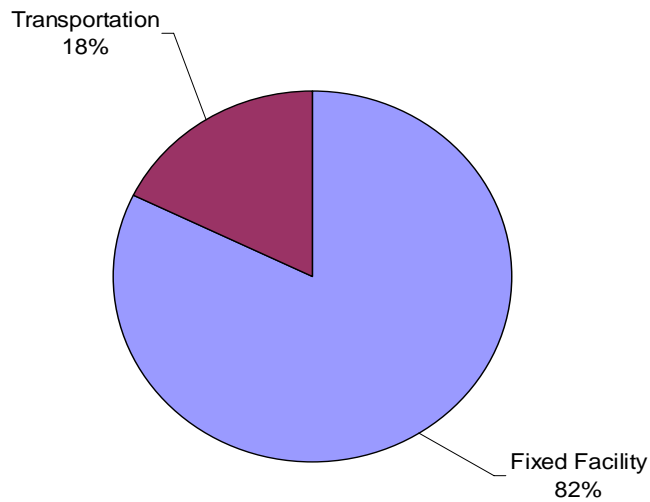
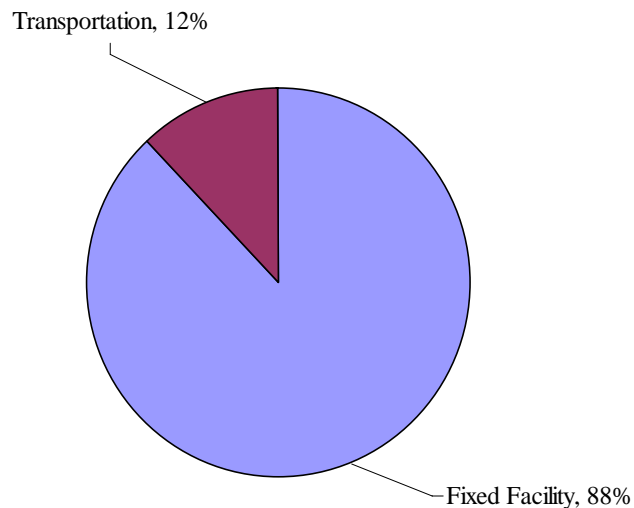
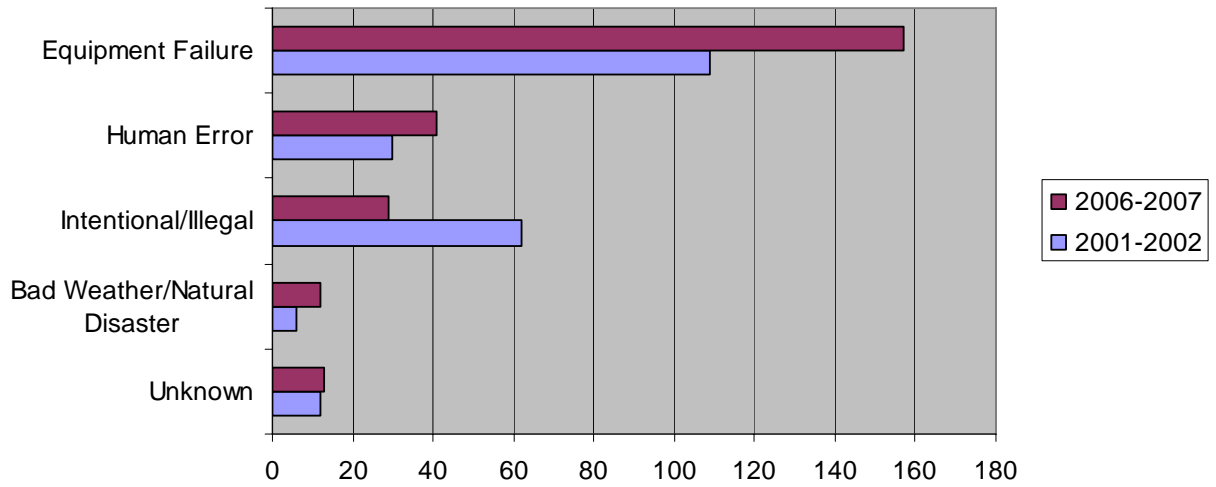


Figure 6
Ammonia Releases by Type
Hazardous Substances Emergency Events Surveillance System
Iowa
2006-2007



Primary factors were reported for each event. Figure 7 shows a comparison of primary factors for 2001-2002 and 2006-2007.

Figure 7
Primary Causes of Ammonia Releases
Hazardous Substances Emergency Events Surveillance
Iowa
2001-2002 and 2006-2007



Victims of ammonia releases are those individuals with symptoms or injuries that result from the event and who sought some type of medical attention or died as a consequence of the event. Figures 8 and 9 display the victim categories for all victims associated with ammonia releases.

Figure 8
Total Number of Victims in Ammonia Releases by Victim Category
Hazardous Substances Emergency Events Surveillance System
Iowa
2001-2002

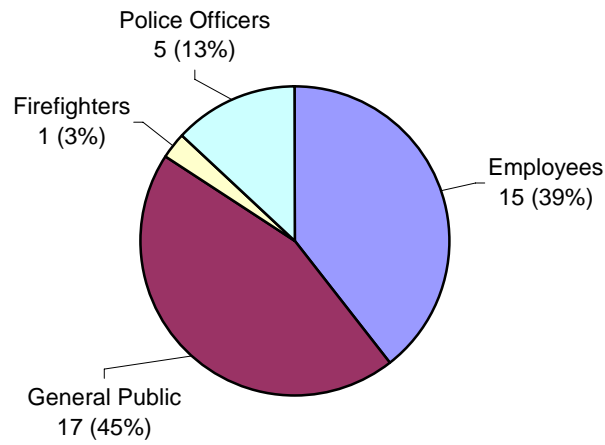
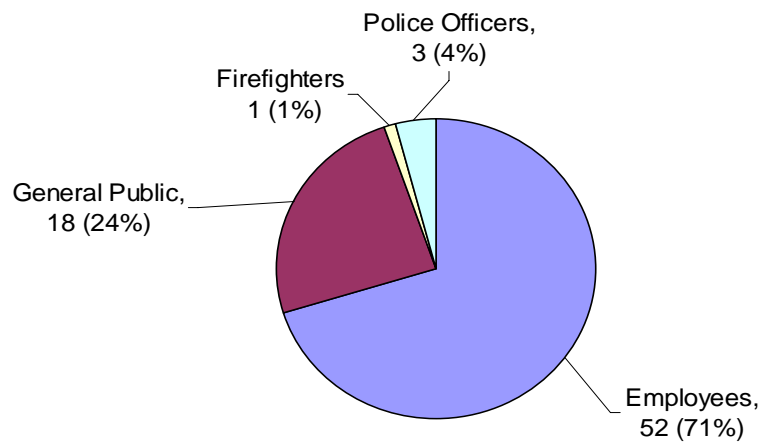


Figure 9
Total Number of Victims in Ammonia Releases by Victim Category
Hazardous Substances Emergency Events Surveillance System
Iowa
2006-2007



PREVENTION/OUTREACH ACTIVITIES

Because of the high number of ammonia releases that relate to the agricultural industry, Iowa HSEES program staff developed a reusable safety sticker as a strategy to reduce the risk of agricultural-related ammonia incidents. For each ammonia release that occurred in 2001 and 2002, Iowa HSEES program staff contacted the responsible party to discuss factors that contributed to the incident. The content of the sticker was based on these conversations as well as collaboration with the Iowa Department of Agriculture and Land Stewardship, the Iowa Department of Natural Resources, two ammonia retail facilities and a clean up contractor. It contains general safety reminders as well as a checklist for before loading and after loading. The safety sticker project was piloted in Story County because that county was identified as having the highest number of agricultural related ammonia releases. In the spring 2004, safety stickers were distributed to area farmers when purchasing ammonia for use during planting season at 16 retail facilities. From 1999 through 2003, an average of six agricultural-related ammonia releases per year was reported to HSEES for Story County, and during 2006 and 2007 only three releases were reported (average 1.5 per year). Distribution of the safety sticker was expanded to an additional 15 counties (135 retail facilities) in the spring of 2005. Eleven of these 15 counties had a subsequent reduction in agricultural-related ammonia incidents, one remained the same and two experienced increases.

HSEES staff attempted to reach out to the farm community by having an ammonia safety display in the Health & Safety tent at the Iowa Farm Progress Show in 2006 and 2008.

SUMMARY

Anhydrous ammonia releases were studied during two two-year periods (2001-2002 and 2006-2007) by the HSEES program in Iowa. In 2001-2002 there were 643 events entered into the surveillance system. Of those, 219 (34%) involved ammonia. In 2006-2007 there were 916 events entered into the surveillance system. Of those, 252 (28%) involved ammonia. Although the total number of releases has significantly increased over the past years, the percentage of ammonia releases decreased. In the fall of 2005, the Iowa Poison Control Center (IPCC) became a reporting source for the HSEES program. The reports received from IPCC did have an impact on the overall number of chemical releases reported to the HSEES. The IPCC is responsible for reporting an average of 23 percent of all the chemical releases entered in the HSEES system. The enactment of the restricted sale of pseudoephedrine in May of 2005 influenced the number of ammonia releases and the number of injuries to the public because the number of clandestine drug labs was reduced. Pseudoephedrine and ammonia are key ingredients in the manufacture of methamphetamine.

Given the amount of ammonia handled every year in Iowa, the number of victims is relatively small. Nevertheless, most accidents consistently result from equipment failure and human error both of which are preventable. This data suggests that more stringent safety measures must be taken, and education of employees, responders, and the general public about the hazards of ammonia must be reinforced.

Addressing the need to protect employees, responders and the public from ammonia releases requires a collaborative effort among state and local agencies as well as the ammonia industry. The development of additional prevention/outreach activities will lay the groundwork for effective hazard reduction and prevention. The Iowa HSEES will work to maximize its impact by establishing partnerships for prevention whenever possible and will continue to explore opportunities to inform and educate the agricultural community on the dangers of ammonia.